# Urban Noise as a Stressor In *Uta stansburiana*

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## Introduction

•Urbanization has a significant impact on the behavior and health of wildlife (Ditchkoff et al. 2006).

•Urban noise can act as such a stressor (Francis and Barber 2013).

•Noise stress can also increase an animal's circulating stress hormone concentrations (Blickey et al. 2012). Chronic elevated levels of glucocorticoids can cause decreased immune function and reproductive ability (Wingfield et al. 1998).

## Hypothesis

Male *Uta stansburiana* will show increased circulating corticosterone and decreased testosterone hormone concentrations when subjected to urban noise stress.

As circulating corticosterone hormone concentrations increase, percent bacteria killed will decrease (there will be a negative correlation).

## Methods

•We randomly assigned male *U*ta into the control (19 lizards) and noise stress (19 lizards) treatment groups.
•Control animals experienced background lab noise while the noise stress animals were played a 24 hr audio loop with urban noise clips.
•We ran the experiment for nine days
•We then collected blood samples to measure hormone concentration (radioimmunoassay) and immune function (bacterial killing assay).

## Results

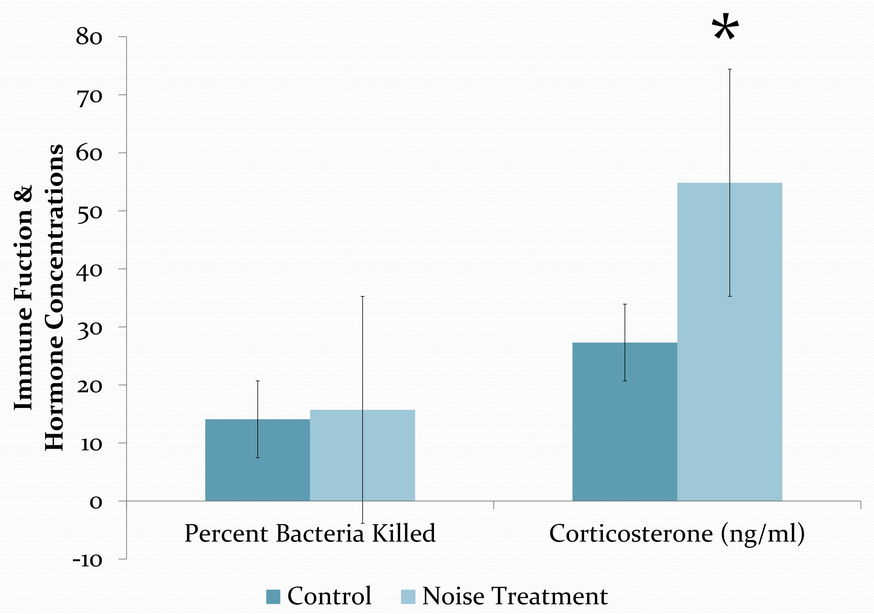


Figure 1. The relationship between control and noise stress treatment groups for the bacterial killing ability and corticosterone concentration. (The asterisk denotes significant results.) Bacterial killing ability showed no significant difference ($p = 0.80$). Corticosterone concentration was significantly different ($p = 0.04$). Hormone concentration is measured in nanograms per milliliter of blood. Testosterone (not shown here) did not have significant results ($p = 0.59$).

Table 1. Regression model of physiological parameters affecting immune function.

| Overall Model | | | Model Parameters | | |
|---|---|---|---|---|---|
| $R^2$ | F ratio | p-value | Variable | Estimate | Prob > t |
| 0.37 | $F_{3,35} = 6.22$ | .002 | Body Condition | 2.03 | 0.002 |
| | | | LogCORT | 1.65 | 0.015 |
| | | | LogTEST | -1.31 | 0.016 |

## Literature Cited

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## Discussion

•Noise stress caused a significant increase in the circulating corticosterone levels of male *Uta stansburiana*. These results are similar to findings in previous studies with male greater sage grouse (Blickley et al. 2012). However, testosterone was not different between the two groups.

•Increased corticosterone concentration showed a positive correlation with immune function. This is similar to the immune response associated with an acute stressor as described by Wingfield et al. (1998). However, this study showed that other variables also affected immune function.

•Increased body condition showed a positive correlation with immune function. This is unsurprising, as it has been previously described by Møller et al. (1998).

•Decreased testosterone concentration showed a negative correlation with immune function. This is in line with the immunocompetence handicap hypothesis (Folstad and Karter 1992).

•While body condition and testosterone concentration were not significantly different between the two treatment groups, corticosterone was. Together, these three parameters accounted for 37% of the variability in immune function.

•This study showed that noise stress significantly increased corticosterone levels which are negatively associated with immune function. Future studies may wish to use female *Uta stansburiana* to more accurately measure reproductive investment to account for another major variable in the relationship between stress and immunity.

## Acknowledgments

This study was funded by the Department of Biology and the Department of Undergraduate Research. Special thanks to Andrew Durso and Heather Skinner for their individual contributions, and to the rest of the members of the USU herpetology labs for putting up with all the noise in the duration of the study.